

# Exhibit A

## MASSACHUSETTS INSTITUTE OF TECHNOLOGY

## School of Engineering Faculty Personnel Record

Date: April 2005

Full Name: Alexander H. Slocum  
 Department: Mechanical Engineering

1. Date of Birth: on file

2. Citizenship: U.S.

<u>School</u>	<u>Degree</u>	<u>Date</u>
M.I.T.	S.B., M.E	June 1982
M.I.T.	S.M., M.E	Jan. 1983
M.I.T.	Ph.D., M.E.	June 1985

4. Title of Thesis for Most Advanced Degree:

*Sensor System Design to Determine Position and Orientation of Articulated Structures*

5. Principle Field of Interest:

*Precision Engineering*

6. Name and Rank of Other Department Faculty in the Same Field:

Steven Dubowsky, Professor  
 Kamal Youcef-Toumi, Professor  
 Sanjay Sarma, Associate Professor  
 Sang-Gook Kim, Associate Professor  
 David Trumper, Professor  
 George Barbastathis, Assistant Professor  
 Martin Culpepper, Assistant Professor  
 Carol Livermore, Assistant Professor  
 Samir Nayfeh, Assistant Professor

7. Name and Rank of Faculty in Other Departments in Same Field:

Jeff Lang, Professor, Electrical Engineering  
 Martin Schmidt, Professor, Electrical Engineering

8. Non-MIT Experience:

<u>Employer</u>	<u>Position</u>	<u>Beginning</u>	<u>End</u>
NIST	Mechanical Engineer	June 1982	Sept. 1986
Cranfield Inst. Tech.	Visiting Professor	Oct. 1989	Oct.1990

## 9. History of M.I.T. Appointments:

<u>Rank:</u>	<u>Beginning</u>	<u>End</u>
Assistant Professor (CE)	Sept. 1985	July 1989
Assistant Professor (ME)	July 1991	July 1992
Associate Professor (ME)	July 1992	July 1995
Associate Professor (ME, tenured)	July 1995	July 1998
Professor	July 1998	never

## 10. Consulting Record:

<u>Firm</u>	<u>Beginning</u>	<u>End</u>
NIST	Sep. 1985	Aug. 1997
Makino Machine Tool Corp.	Feb. 1989	June 1995
CPE Ltd.	Oct. 1989	Oct. 1990
NSK Corp.	Nov. 1989	Jan. 1992
K. Jung GmbH	Mar. 1990	Aug. 1996
Polaroid Corp.	Oct. 1990	Aug. 1996
Wilbanks International	Oct. 1990	June 1995
Litton Landis	Oct. 1990	Sept. 1993
THK Corp.	Nov. 1990	Jan. 1992
Southern Cross Corp.	Jan. 1991	Jan. 1992
Thomson Industries	July 1991	Aug. 1997
Department of Justice	Jan. 1992	Dec. 1992
Sematech	Apr. 1992	June 1996
Silicon Valley Group	Aug. 1992	Aug. 1995
Weldon Machine Tool Co.	July 1992	July 1992
Kulicke & Soffa	Nov. 1992	Jan. 1994
Nikon Corp.	June 1993	Aug. 1995
Cummins Engine	May 1994	Aug. 1995
Society for Manufacturing Engineers	Jan. 1994	Aug. 2003
Teradyne, Inc.	June 1995	Present
Applied Materials	Aug. 1995	Aug. 1997
ETEC Corp.	Aug. 1996	Aug. 1996
Walt Disney Corp.	Jan. 1995	Aug. 1997
Weil, Gotshal & Manges LLP	Jan. 1996	April 1988
Emhart Glass	June 1998	Sept. 1999
Transform Pharmaceuticals	May 2000	Present
ESI	June 2000	June 2002
Willcox, Pirozzolo & McCarthy	Oct. 1998	Feb. 2004
ABB	Sept. 1999	present
Nanotechtonica	May 2001	present
Wolf Greenfield	April 2002	June 2003
Hale and Dorr LLP	March 2002	Aug. 2003
Fish & Neave	Dec. 2002	Feb. 2003
Overbeck, Corp	Jan. 2003	Present
Woodcock Washburn LLP	Sept. 2003	Present
Kluger, Peretz, Kaplan, & Berlin	Oct. 2003	Present
Formfactor	July 2004	Present
Okamoto Corp	July 2005	Present

## 11. Department and Institute Committees, Other Assigned Duties:

<u>Activity</u>	<u>Beginning</u>	<u>End</u>
Inst. Comm. on Design in UG Education	Feb. 1987	June 1988
Inst. UG Admissions Folder Reader	Jan. 1987	Present
Inst. Committee on the Hobby Shop	July 1989	June 1997
Chairman, Inst. Committee -- Hobby Shop	June 1997	Present
Dept. Committee on Graduate Curricula	Oct. 1992	June 1993
Dept. Support Staff Cost Committee	Mar. 1994	May 1994
Pi Tau Sigma Faculty Advisor	May 1994	Jan. 2002
Dept. Faculty Search Committee	Jan. 1995	June 1995
Leader, OME 2nd Summer Design Program	Jan. 1996	Present
Educational Council	June 1996	Present
ME Strategic Planning Committee	Sept. 1996	June 1998
ME Design Faculty Search Committee	Jan. 1997	June 1998
Designated Course Professors Committee	Sept. 1997	June 2004
ME Design Faculty Search Committee	Jan. 1998	Nov. 1998
Space Committee	Jan. 2000	Sept. 2003
CalTech/MIT Voting Commission	Jan. 2001	June 2001
ME Council	Jan 2004	Present
Director: Experimental Study Group	Sept. 2004	Present

## 12. Professional Service:

<u>Activity</u>	<u>Dates</u>
Office of Secretary of Defense, Foreign Strategic Trade	June 1990-Present
Department of Justice, Bearing Tariffs Jan.1992-Dec.1992	
NIST, Technology Assessment	June 1986-Aug. 1997
Amer. Soc. Precision Eng., Nominations May 1997-present	
National Science Foundation, Review panel	June 1991-present
International Scientific Committee of the European	
Union Society for Precision Engineering and Nanotechnology	Feb. 2004-present
Session Cahir "Education" 4th. Intl. Conf. Advanced Engineering Design, Glasgow, Scotland,	Sept. 5-8, 2004
Scientific Committee Member for European Union Society for Precision Engineering & Nanotechnology 2005 mtg.	2005
Vice Chair, ASME Design Education Committee	2005

## 13. Awards or Honors Received:

<u>Award or Honor</u>	<u>Date</u>
1. U.S. DoC Development of an Advanced Robot Gripper	Feb. 1984
2. U.S. DoC Outstanding Performance Rating	Mar. 1985
3. SME Outstanding Contribution to FMS	Feb. 1986
4. U.S. DoC Outstanding Performance Rating	Mar. 1986
5. U.S. DoC Outstanding Performance Rating	Mar. 1986
6. U.S. DoC Development of Robotic Micromanipulator	June 1986
7. U.S. DoC Robot End Effector Patent	July 1986
8. U.S. DoC Robotic Micromanipulator Patent	July 1986
9. SME Outstanding Contribution to Robotics	Aug.1986
10. U.S. DoC Bronze Medal Award for Federal Service	Dec. 1986
11. NSF Presidential Young Investigator	June 1987

12. Royal Society Visiting Scholar Fellowship Aug. 1988
13. Oak Ridge Offsite Research Fellowship Aug. 1988
14. SME Earl E. Walker Outstanding Young Manufacturing Engineer Award June 1993
15. ASCE 1994 Thomas Fitch Rowland Prize
16. 1994 R&D 100 Award for one of 100 best new technical products of the year (ShearDamper™)
17. 1994 International Machine Tool Show "Best of Show" award for development of Weldon Machine Tool's 1632 Gold Cylindrical Grinder (it used Slocum's hydrostatic bearings and ShearDamper technology).
18. 1994 R&D 100 Award for one of 100 best new technical products of the year (HydroGuide™)
19. 1995 R&D 100 Award for one of 100 best new technical products of the year (HydroSpindle™)
20. 1996 R&D 100 Award for one of 100 best new technical products of the year (TurboTool™ Ultra-High Speed Spindle)
21. SME 1997 SME Frederick W. Taylor Research Medal
22. 1997 R&D 100 Award -one of 100 best new technical products of the yr. (Machining Variation Analysis)
23. 1997 R&D 100 Award-- one of 100 best new technical products of the yr. (ShieldBeam™ Contactor)
24. 1997 R&D 100 Award-- one of 100 best new technical products of the yr. (Kinematic Docking System)
25. 1998 R&D 100 Award-- one of 100 best new technical products of the yr. (Q-Tool™)
26. Who's Who in America Science and Engineering
27. Martin Luther King Jr. Leadership Award, January 1999.
28. MacVicar Faculty Fellow, January 1999.
29. 1999 R&D 100 Award-- one of 100 best new technical products of the yr. (Quasi Kinematic Coupling for Engine Assembly)
30. Massachusetts Professor of the Year Award, November 2000
31. Who's Who Among America's Teachers
32. ASME Leonardo da Vinci Award, 2004

14. Current Organization Membership:

American Society of Mechanical Engineers, Fellow  
 Society of Manufacturing Engineers, Member  
 American Society for Precision Engineering, Member  
 IEEE, Member

15. Patents:

- 1) Slocum, "Mechanism for Determining Position and Orientation in Space", 4,606,696, August 19, 1986
- 2) Slocum, "Mechanism for Determining Position and Orientation in Space", 4,676,002, June 30, 1987
- 3) Slocum, J. Peris, "Method and Mechanism for Fixturing Objects", 4,685,661, August 11, 1987
- 4) A. Slocum, J. Peris, L. Greenspan, "Robotic Micromanipulator", 4,694,230, September 15, 1987
- 5) A. Slocum, P. Jurgens, "Double End Effector", 4,765,668, June 23, 1988
- 6) A. Slocum, "Inclined Contact Recirculating Roller Bearing", 4,765,754, June 23, 1988 (NIST).
- 7) A. Slocum, "Method and Mechanism for Converting Rotary to Linear Motion", 4,836,042, June 6, 1989
- 8) A. Slocum, "Multiple Actuator Hydraulic System & Rotary Control Valve", 4,838,145, June 13, 1989
- 9) E. Heatzig, A. Slocum, "Multi-Axis DSP-Based Parallel Processing Servo Controller for Machine Tools and Robots", #4,878,002, October 31, 1989

- 10) A. Slocum, D. Thurston, "System to Provide High Speed, High Accuracy Motion", #4,987,526, Jan. 22, 1991
- 11) Z. Saidin, A. Slocum, "Brushless Motor Control Method and Device", #5,023,528, June 11, 1991
- 12) A. Slocum, A. Ziegler, "Automated Shear Stud Welding System", #5,130,510, July, 1992
- 13) A. Slocum, "System to Convert Rotary Motion to Linear Motion", #5,090,265, Feb. 25, 1992
- 14) A. Slocum, "Self Compensating Hydrostatic Linear Bearing", #5,104,237, April 14, 1992
- 15) A. Slocum, "Self -Compensating Hydrostatic Bearings for Supporting Round Shafts for Rotary and/or Linear Motion", #5,281,032, February 20, 1994
- 16) A. Slocum, "High Speed Hydrostatic Spindle", #5,466,071, Nov. 1995
- 17) A. Slocum, "Machine Tool Apparatus and Linear Motion Track Therefore", #5,472,367, Dec. 5, 1995
- 18) A. Devitt, A. Slocum, "Method for Manufacturing Externally Pressurized Bearing Assemblies", #5,488,771, Feb. 6, 1996
- 19) A. Slocum, K. Wasson, "Low Profile Self Compensated Hydrostatic Thrust Bearing", #5,533,814, July 1996
- 20) A. Slocum, "Slit-Tube Replicated In-Place Constrained Layer Damper and Method", #5,667,204, September 1997
- 21) A. Slocum, D. Braunstein, L. Muller, "Flexural Kinematic Couplings", #5,678, 944, October 1997
- 22) N. Kane, A. H. Slocum, "Elastically Supported Self-Compensating Flow Restrictors for Optimizing Hydrostatic Bearing Performance", #5,484,208, Jan. 1996
- 23) A. Slocum, "Method and Apparatus for Locating and Orienting a Part on a Gripper and Transferring it to a Tool while Maintaining Location and Orientation on the Tools", 5,711,647, January 1998
- 24) A. Slocum, Todd Solomon, "Robotic Joint Using Metal Bands", # 5,682,795, December 1997
- 25) K. L. Wasson & A.H. Slocum, "Integrated Shaft Self-Compensating Hydrostatic Bearing", #5,700,092, Dec. 23 1997
- 26) A. Slocum, K. Wasson, "Tooling System and Method with Integral Hydrostatic Bearings and Turbine Power Source", #5,674,032, Oct. 7, 1997
- 27) A. Slocum, "Method and Apparatus for Damping Bending Vibrations While Achieving Temperature Control in Beams and Related Structures", #5,743,326
- 28) A. Slocum, "Kinematic Coupling Fluid Couplings and Method", #5,683,118
- 29) A. Slocum, et-al, "Modular System", #5,733,024, March 31, 1998
- 30) A. Slocum, S. Ziegenhagen, R. Slocum, L. Muller, "Integrated Circuit Tray with Flexural Bearings", #5,758,776, June 2, 1998
- 31) M. Culpepper, A. Slocum, "Debris cleaner with compound auger and vacuum pickup", 5,784,756 July 28, 1998
- 32) A. Slocum, M. Chiu, "Interface Apparatus for Automatic Test Equipment", #5,821,764, Oct. 1998
- 33) A. Slocum, E. Marsh, D. Smith, "Replicated In-Place Internal Viscous Shear Damper for Machine Structures and Components", #5,799,924, Sept. 1, 1998
- 34) A. Slocum, "Surface Textured Cleansing Device and Method with Massaging Effect", #5,834,410, Nov. 10, 1998
- 35) A. Slocum, S. Ziegenhagen, "Expanding Gripper with Elastically Variable Pitch Screw", #5,839,769, Nov. 24, 1998
- 36) A. Slocum, "Kinematic Coupling Method And System For Aligning Sand Mold Cores And The Like And Other Soft Objects And Surfaces", #5,769,554
- 37) A. Slocum, J. Miskoe, "Container Restraining Mechanism and Method, #5,848,669, Dec. 15, 1998
- 38) A. Slocum, et. al., "I.S. Machine" (bottle making machine for Emhart Glass), #5,858,050, Jan. 12, 1999
- 39) A. Slocum, et. al., "Mold Carrier Assembly for an I.S. Machine Mold Opening and Closing Mechanism" (bottle making machine for Emhart Glass), #5,865,868, Feb. 2, 1999.
- 40) A. Slocum, et. al., "Mold Opening and Closing Mechanism for an IS Machine", #5,887,450, March, 1999

## Patents (continued):

- 41) A. Slocum, C. Ho, "Modular Storage System, Components, Accessories, And Applications To Structural Systems And Toy Construction Sets And The Like", # 5,888,114, March 30, 1999
- 42) A. Slocum, D. Braunstein, "Kinematic Coupling for Thin Plates and Sheets and the Like", #5,915,678, June 29, 1999
- 43) A. Slocum, "Method of manufacturing Ball Grid Arrays for Improved Testability", #5,924,003, Jul. 13, 1999.
- 44) A. Slocum, R. Ziegenhagen, "Flexible shielded laminated beam for electrical contacts and the like and method of contact operation", #5,921,786, July 1999
- 45) A. Slocum, et. al., "Manipulator for Automatic Test Equipment Test head", #5,931,048, Aug. 3, 1999.
- 46) Mungovan, J.P. et. al. "IS Machine", # 5,938,809, August, 1999.
- 47) A. Slocum, "Method of and apparatus for substance processing with small opening gates actuated and controlled by large displacement members having fine surface finishing", #5,964,242, Oct. 1999
- 48) A. Slocum, D. Gessel, "Semiconductor chip tray with rolling contact retention mechanism", #5,971,156, Oct. 26, 1999
- 49) N. Kane, A. Slocum, "Modular Hydrostatic Bearing with Carriage Form-Fit to Profile Rail", #5,971,614, Oct. 1999
- 50) A. Slocum; Alexander, R. Ziegenhagen, R. Richard, "Small contactor for test probes, chip packaging and the like", # 5,973,394, Oct. 26, 1999
- 51) M. Chiu, D. Levy, A. Slocum, "Interface Apparatus for Automatic Test Equipment With Positioning Modules Incorporating Kinematic Surfaces", #5,982,182, Nov, 1999
- 52) A. Slocum, "Method of Manufacturing Ball Grid Arrays for Improved Testability", #5,924,003, July 13, 1999
- 53) A. Slocum, L. Muller, "Integrated Prober, Handler, and Tester for Semiconductor Applications", 6,024, 526, Feb. 2000
- 54) A. Pfahnl, A. Slocum, J. Lienhard, "Heat-transfer enhancing features for semiconductor carriers and devices", #6,036,023, March 14, 2000
- 55) A. Slocum, M. Chiu, "Interface Apparatus for Automatic test Equipment ", #6,104,202, August, 2000
- 56) A. Slocum, "System to Simultaneously Test Trays of Integrated Circuit Packages", #6,097,201, August 2000.
- 57) A. Slocum, "Linear motion carriage system and method with bearings preloaded by inclined linear motor with high attractive force", #6,150,740, Nov., 2000
- 58) M. Culpepper, A. Slocum, "Quasi-Kinematic Coupling and Method for Use in Assembling and Locating Mechanical Components and the Like", # 6,193,430, Feb. 2001
- 59) A. Slocum, K. Wasson, "Damped tool holder and method", #6,280,126, Aug, 2001
- 60) T. Brogardh, H. Jerrerd, A. Robertson, A. Slocum, P. Willoughby, "Device and a method for calibration of an industrial robot", #6,418,774, July 2002
- 61) A. Slocum, "Single carriage robotic monorail material transfer system", 6,446,560, Sept. 10, 2002
- 62) A. Slocum, A. Pfahnl, E. Walker, R. Sartschev, "Temperature control structure", #6,448,575, September 10, 2002
- 63) A. Slocum, "Robust, small scale electrical contactor", #6,497,581, Dec. 24, 2002.
- 64) S. Awatar, A. Slocum, "Apparatus Having Motion with Pre-Determined Degrees of Freedom", #6,699,183, Feb. 10, 2004
- 65) S. Longson, A. Slocum "Wafer Level Contactor", #6,768,331, July 27, 2004.
- 66) J. Cherng, M. Cima, J. Gonzalez-Zugasti, N. Kane, A. Lemmo, C. Moore, A. Slocum, "Method and apparatus for manipulating and measuring solids"
- 67) About a dozen more misc. pending

16. Professional Registration: None.

17. Major New Products, Processes, Designs, or Systems:

- SEMI E57-1296 Kinematic Coupling Standard. I proposed to SEMI/Sematech a new standard for locating 300 mm wafer cassettes, and then led the formulation and implementation of the standard, which is now in use by all companies for 300 mm semiconductor wafer cassettes and interfaces
- OMAX Jet Machining Center (3 different models). See: [www.omax.com](http://www.omax.com).
- Weldon 1632 Gold Grinder
- International Machine Tool Show (IMTS: "Best of Show" award for development Weldon Machine Tool's 1632 Gold Cylindrical Grinder (it used Slocum's hydrostatic bearings and ShearDamper technology), Sept. 1994.
- ShieldBeam Contactor, manufactured by Teradyne, which won an R&D 100 Award for one of 100 best new technical products of the year, June 1997.
- K-Dock Kinematic Docking System, manufactured by Teradyne, which won an R&D 100 Award for one of 100 best new technical products of the year, June 1997.
- Executive Producer for inner-city kids' rap group Mental Block, their first CD entitled, "IF".
- Kinetrix, Inc. (a new startup I helped create) Apollo Semiconductor Device Sorter and Galileo Semiconductor Device Handler
- Created web sites and programs for the Urban Design Corp ([www.urbandesigncorp.org](http://www.urbandesigncorp.org)), and Paths-to-Peace ([www.pathstopace.org](http://www.pathstopace.org)) to help teach kids to design and create and to promote better understanding between cultures.
- Advised 2<sup>nd</sup> Summer students as UROPs to pursue patenting their device "Ergonomic Cleaning Apparatus with Multiple Scrubbing Surfaces", US Patent # 5,915,869, June 1999.
- Worked with Overbeck Corp. of Long Island, NY to create the L/T Grinding machine, which was featured as a cover article: "Get a Preload of This", American Machinist, December 2002.
- Executive Producer for "Journey of The Lost Souls" by Marc Graham (book of poems and rap CD)
- Dial Soap "Quest for the Best" consumer product search finalist for "Massagasoap"
- NoodleNodes™ foam play toy ( [www.noodlenodes.com](http://www.noodlenodes.com) )

Currently under Development:

- Animaroos (learn to design, read, write, make) toys
- PetalPot™ flower pots made from mixed recycled plastics
- HeliSoap™ helical soap bar for hotels that is 30% larger in volume, 30% lighter weight
- WallBot: wall-size bolt-in-place robot for machining entire walls (for Prof. mark Goulthroe in Dept. of Architecture).
- Secrete new line of high precision, low cost machine tools
- New nanotube production process (Deshpande grant)



## Teaching Experience of Alexander H. Slocum

<u>Term</u>	<u>Subject Number</u>	<u>Title</u>	<u>Role</u>
ST 1986	1.965	Special Studies in Civil Engineering	Lect. in Charge
FT 1986	1.964	Design for Construction Automation*	Lect. in Charge
ST 1987	1.13	Design for Construction Automation*	Lect. in Charge
FT 1987	1.08	Introduction to Robotics*	Lect. in Charge
FT 1987	1.502A	Freshman Seminar "Design of Machine Systems"	Lect. in Charge
ST 1988	1.13	Design for Construction Automation*	Lect. in Charge
FT 1988	2.70	Introduction to Design	Recitation
FT 1988	1.S04	Fr Freshman Seminar "Precision Machine Design"	Lect. in Charge
ST 1989	2.996	Precision Machine Design*	Lect. in Charge
FT 1991	2A08	Freshman Seminar: Precision Machine Design*	Lect. in Charge
FT 1991	2.731	Advanced Engineering Design	Co-lecturer
ST 1992	2.732	Advanced Engineering Design	Co-lecturer
ST 1992	2.840	Precision Machine Design*	Lect. in Charge
FT 1992	2A08	Freshman Seminar: Precision Machine Design*	Lect. in Charge
FT 1992	2.731	Advanced Engineering Design	Co-lecturer
ST 1993	2.732	Advanced Engineering Design	Co-lecturer
ST 1993	2.75	Precision Machine Design*	Lect. in Charge
FT 1993	2A08	Freshman Seminar: Precision Machine Design*	Lect. in Charge
FT 1993	2.72	Machine Elements	Co-lecturer
ST 1994	2.75	Precision Machine Design*	Lect. in Charge
FT 1994	2A08	Freshman Seminar: Precision Machine Design*	Lect. in Charge
FT 1994	2.73	Design	Co-Lect. in Charge
ST 1995	2.70	Introduction to Design	Lect. in Charge
FT 1995	2A08	Freshman Seminar: Design of Toys & Games*	Lect. in Charge
FT 1995	2.75	Precision Machine Design*	Lect. in Charge
IAP 1996	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 1996	2.70	Introduction to Design	Lect. in Charge
FT 1996	2A08	Freshman Seminar: Design of Toys & Games*	Lect. in Charge
FT 1996	2.75	Precision Machine Design*	Lect. in Charge
IAP 1997	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 1997	2.007	Introduction to Design	Lect. in Charge
IAP 1998	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 1998	2.75	Precision Machine Design*	Lect. in Charge
ST 1998	2.007	Introduction to Design	Lect. in Charge
FT 1998	2.009	Product Design Section Instructor	
IAP 1999	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 1999	2.007	Introduction to Design	Lect. in Charge
IAP 2000	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 2000	2.007	Introduction to Design	Lect. in Charge
ST 2000	2.75	Precision Machine Design*	Lect. in Charge
IAP 2001	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 2001	2.007	Introduction to Design	Lect. in Charge
FT 2001	2.75	Precision Machine Design*	Lect. in Charge
FT 2001	2.997	(J with 6.963 Medical Innovation)	Co-Lect. in Charge
IAP 2002	2.971	2nd Summer Intro. to Design*	Lect. in Charge
IAP 2002	2.996	Paths to peace*	Lect. in Charge
ST 2002	2.007	Introduction to Design	Lect. in Charge
FT 2002	2.996	Paths to peace*	Lect. in Charge
IAP 2003	2.971	2nd Summer Intro. to Design*	Lect. in Charge

ST 2003	2.007	Introduction to Design	Lect. in Charge
FT 2003	SP247	8.01 Physics with Sports*	Lect. in Charge
FT 2003	2.75	Precision Machine Design*	Lect. in Charge
IAP 2004	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 2004	2.007	Introduction to Design	Lect. in Charge
FT 2004	SP247	8.01 Physics with Sports*	Lect. in Charge
FT 2004	2.75	Precision Machine Design*	Lect. in Charge
IAP 2005	2.971	2nd Summer Intro. to Design*	Lect. in Charge
ST 2005	2.007	Introduction to Design	Lect. in Charge

\* Indicates subject developed by Slocum

#### Publications of Alexander H. Slocum

##### 1. Books:

- 1) Slocum, A. H., Precision Machine Design, © 1995, Society of Manufacturing Engineers, Dearborn, MI. (first published by Prentice Hall in 1992)
- 2) Slocum, A. H., FUNDaMENTALS of Design, © 2005, Oxford University Press (in press)

##### 2. Papers in Refereed Journals:

- 1) McClintock, F. A., Slocum, A. H., "Predicting Fully Plastic Mode II Crack Growth from an Asymmetric Weld Defect," International Jrl. of Fracture Vol. 27, 1985, pp 49-62.
- 2) Slocum, A. H., "Design to Limit Thermal Effects on Linear Motion Bearing Components," Int. Jrl. Machine Tool Design, Vol. 27, No. 2, 1987, pp 239-245.
- 3) Slocum, A. H., Greenspan, L., Peris, J.P., "Design and Implementation of a Five Axis Robotic Micro-manipulator," Int. Jrl. Machine Tool Design, Vol. 28, No. 2, 1988, pp 131-141.
- 4) Slocum, A. H., "Development of a Six Degree-of-Freedom Position and Orientation Sensing Device: Design Theory and Testing," Int. Jrl. Machine Tool Design , Vol. 28, No. 2, 1988, pp 131-139.
- 5) Slocum, A. H. "Kinematic Couplings for Precision Fixturing - Part I - Formulation of Design Parameters," Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol. 10, No. 2, April 1988, pp 85-91.
- 6) Slocum, A. H. and Donmez, A., "Kinematic Couplings for Precision Fixturing - Part II - Experimental Determination of Repeatability and Stiffness," Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol. 10, No. 3, July 1988, pp 115-122.
- 7) \*Slocum, A. H. and Schena, B., "Blockbot: A Robot to Automate Construction of Cement Block Walls," Robotics, Vol. 4, 1988, pp 111-129.
- 8) \*Slocum, A. H. and Ziegler, A., "An Automated Shear Stud Welding System," Jrl. Robotics and Autonomous Systems, Vol. 6, 1990, pp 367-382.
- 9) Slocum, A. H. "Design of Three-Groove Kinematic Couplings," Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol. 14, No. 2, April 1992, pp 67-76.
- 10) \*Battles, A.E., Linder, B. M., Chang, K.W., Slocum, A.H., "The Design of a Precision Bilaminar Resonating Transducer Assembly Tool", Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol. 15, No. 4, Oct. 1993, pp 248-257.
- 11) \*Everett, J. G., and Slocum, A. H. "CRANIUM: Device for Improving Crane Safety and Productivity," ASCE Jrl. Construction Engineering and Management, 1994, 119 (1), pp 1-17. Received the ASCE 1994 Thomas Fitch Rowland Prize.
- 12) \*Smith, M.H., Annaswamy, A.M., Slocum, A.H., "Adaptive Control Strategies for a Precision Machine Tool Axis", Precision Engineering, Vol. 17, No. 3, 1995, pp. 192-206.

- 13) \*Slocum, A. H., Marsh, E.R., Douglas H. Smith, "A New Damper Design for Machine Tools and Components: "The Replicated Internal Viscous Damper," Precision Eng., Vol. 16, No. 3, June. 1994, pp 174-183.
- 14) \*Slocum, A.H., Scagnetti, P.E., Kane, N.R., Brünner, C., "Design of Self Compensated Water-Hydrostatic Bearings", Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol. 17, No. 3, 1995, pp 173-185.
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- 26) \*O'Sullivan, D., Q., "Slocum, A.H., "Design of Two-Dimensionally Curved Panels for Sandwich Cores", Journal of Sandwich Structures and Materials, Vol. 05 Issue 01, 1 January 2003, pp 77.
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- 35) Culpepper, M. L., A. H. Slocum, F. Z. Shaikh and Vrsek, G., "Quasi-kinematic Couplings for Low-cost Precision Alignment of High-volume Assemblies," ASME Jou. of Mech. Design, Vol. 126 (4), pp. 456-63.
- 36) Hart, A.J., Slocum, A.H., "Segmented and shielded structures for reduction of thermal expansion-induced tilt errors", Jou. Int. Soc. of Precision Engineering and Nanotechnology, Vol 28, Issue 4, Oct 2004, p. 443-458.
- 37) \*Hou, S.M., Lang, J.H., Slocum, A.H., Weber, A.C., White, J.R., "A High-Q Widely-Tunable Gigahertz Electromagnetic Cavity Resonator", Accepted for publication in JMEMS, Oct 2004.
- 38) \* Plante, JS, Vogan, J.D., El-Aguizy , T, Slocum, A.H., "A Design Model for Circular Porous Air Bearings Using the 1D Generalized Flow Method", accepted for publication in Jou. Int. Soc. of Precision Engineering and Nanotechnology
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- 40) \*Werkmeister, J.B., Slocum, A.H., "Theoretical and Experimental Determination of Capstan Drive Stiffness", submitted to Jou. Int. Soc. of Precision Engineering and Nanotechnology
- 41) \*Awtar, S., Slocum, A.H., "Analysis and Synthesis of Modular Parallel Kineatic Flexure Mechanism", submitted to ASME Jou. of Mech. Design, Nov., 2004
- 42) \*Awtar, S., Slocum, A.H., "Metrology Alignments in XY Stage Characterization", submitted to Jou. Int. Soc. of Precision Engineering and Nanotechnology
- 43) Bamberg, E., Grippo, C.P., Wanakamol, P. Slocum, A.H., Boyce, M.C., Thomas, E.L., "A Tensile Test Device for In-situ Atomic Force Microscope Mechanical Testing", submitted to Jou. Int. Soc. of Precision Engineering and Nanotechnology
- 44) White, J.R., White, C.J., Slocum, A.H., "Octave-Tunable Miniature RF Resonators", submitted to IEEE Microwave and Wireless Components Letters, March 2005.
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\* Indicates paper from student thesis research

### 3. Proceedings of Refereed Conferences:

- 1) Slocum, A. H., "Development of a Flexible Automated Fixturing System," SME Conf. Advanced Machining Technology for Cells and FMS, SME Technical paper MR86-126, Feb. 1986.
- 2) Slocum, A. H., "Development of the Integrated Construction Automation Design Methodology," SME Robots in Education, August 1986.
- 3) \*Slocum, A. H., Hou, B., "Conceptual Design of Automated Systems for Underground Emplacement and Retrieval of Nuclear Waste," Second International Conference on Innovative Mining Systems, University Park, PA, Oct. 1986.
- 4) Slocum, A. H., "Design and Implementation of a Five Axis Robotic Micromanipulator," ASME WAM, Anaheim, CA, Dec. 1986.
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- 8) Slocum, A.H., Eisenhauer, D., "Magnetic Bearings for Precision Linear Slide," SPIE Annual Meeting, Los Angeles, CA, Jan. 1988.
- 9) S\*Tamar, F., Slocum, A.H., "Issues in Development and Application of Conventional and Knowledge-Based Software Systems," Conference on Liability for Imperfect Software, sponsored by Franklin Pierce Law Center, Cambridge, MA, Jan. 1988.
- 10) Slocum, A.H., Eisenhauer, D., "Design Considerations for Angstrom Resolution Machines (ARMs)," NASA Conference on Magnetic Suspension Technology, Hampton, VA, Feb. 1988.
- 11) \*Damazo, B.N., Slocum, A.H., "A Laser Interferometer Based Accelerometer Calibrator," SPIE OPTCON 1988 Precision Instrument Design Section, San Jose, CA.
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- 13) Slocum, A.H., "A Replicated Self-Coupling Hydrostatic Leadscrew for Sub-Micron Applications," Proc. of the 1990 IMTS, Chicago IL, SME technical paper MS90-320.
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- 17) \*Chiu, M.A., Slocum, A.H., "Low Cost, Highly Damped Precision Linear Guideways Using Porous Carbon Air Bearings and Epoxy Replication": Ultraprecision in Manufacturing Engineering (UME3), Aachen, Germany, 1994 and American Society of Precision Engineers, Spring Topical Meeting, Tuscon, AZ 1995.
- 18) \*Chiu, M.A., Slocum, A.H., "Improving Testhead Interfaces with Kinematic Docking", Presented at IEEE Southwest Test Workshop, San Diego, CA 1995.
- 19) \*Chiu, M.A., Slocum, A.H., "Improvements in the Prober/Test Head Mechanical Interface", Presented at IEEE Southwest Test Workshop, San Diego, CA, 1996.
- 20) \*Chiu, M.A., Slocum, A.H., "Getting the Mechanics Right for Semiconductor Test", Semiconductor Fabtech, 1996.
- 21) \*Nayfeh, S, Slocum A.H., "Flexural Vibration of a Viscoelastic Sandwich Beam in its Plane of Lamination," ASME 16th Biennial Conference on Vibration and Noise, 1997.
- 22) \*Chiu, M.A., Slocum, A.H., "Making Production Probe Correlation Repeatable", TUG 1997, Orlando, FL, 1997.
- 23) \*Nayfeh, S. A., Slocum, A.H., "Enhancing Ball-screw Axial Dynamics", Proc. ASPE 13<sup>th</sup> Annual Mtg, St. Louis, MO, USA, 1998
- 24) \*A. C. Pfahnl, J. H. Lienhard V, A. H. Slocum, "Temperature Control of a Handler Test Interface," International Test Conference, Washington, DC, Oct. 20-22, 1998.
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- 26) \*A. C. Pfahnl, J. H. Lienhard V, A. H. Slocum, "Heat-Transfer Enhancing Features for Handler Tray-Type Device Carriers," IEEE Transactions on Components, Packaging, and



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- 27) \*Culpepper, M. L, Slocum, A. H., Shaikh F. Z, "Quasi-Kinematic Couplings For Precision Automotive Assemblies," presented at the 1999 ASME-ICE Fall Technical Conference," Ann Arbor, IN, October, 1999.
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  - 29) \*Pfahnl, A. C., Lienhard V, J. H., Slocum, A. H., "Thermal Management and Control in Testing Packaged Integrated Circuit (IC) Devices," 34th Intersociety Energy Conversion Engineering Conference (IECEC) 1999, Vancouver, British Columbia
  - 30) \*White., J, Slocum, A., Lang, J., "Characterization of the NanoGate™ – a Fundamental New Fluid Flow Control Device with Diverse Applications", 2000 NSF Grantees conference, Vancouver BC, Jan. 2000.
  - 31) \*J. Qiu, J. Lang, A. Slocum, "A Centrally-Clamped Parallel-Beam Bistable MEMS Mechanism" MEMS 2001 Digest 353-356, Interlaken, Switzerland, January 2001
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  - 35) A. Stein, G. Barbastathis, and A. H. Slocum, "Detection of tumor growth from differential acoustic measurements," Optical Society of America (OSA) Topical Meeting on Integrated Computational Imaging Systems (ICIS), Albuquerque, NM, November 2001
  - 36) \*Robertson, A., Willoughby, P., Slocum, A., "Precision Robot Calibration Using Kinetically Placed Inclometers", ASPE Annual mtg, Nov. 2001
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  - 40) \*Robertson, A. P. , Rzepniewski, A., Slocum, A.H., "Measurement and Calibration of High Accuracy Spherical Joints", American Society of Precision Engineers Annual Conference, St Louis, USA, 2002.
  - 41) Slocum, A.H., Awtar, S., Hart, J., "Magnebots: A Magnetic Wheels Based Overhead Transportation Concept", Proceedings of the 2nd IFAC Mechatronics Conference, Berkeley, CA, Nov. 2002, p. 833.
  - 42) Hart, J., Slocum, A.H., "Kinematic Coupling Interchangeability", Proceedings of the 17th ASPE Annual Meeting, 2002, p. 158.
  - 43) \*Gessel, D., Slocum, A.H., Sprunt, A., and Ziegenhagen, S., "Realistic Spring Probe Testing Methods and Results," in Proc. Test Conference, 2002 IEEE International, 2002, pp. 417-423.

- 44) \*Forest, C.R., Sun, Y. , McGuirk, M., Schattenburg, M.L., Spenko, M.J. and Slocum, A.H., "Precision assembly and metrology of x-ray foil optics," presented at the *17th Annual Meeting of the American Society of Precision Engineering*, St. Louis, Missouri, October 20-25, 2002.
- 45) J. Hart, A. Slocum, "Segmented and Shielded Structures for Reduction of Thermal Expansion-Induced Tilt Errors", *Proceedings of the 17th ASPE Annual Meeting*, 2002, p. 193.
- 46) Slocum, A.H., Elmouelhi, A., Lawrence, T., How, P., Cattell, J., "Linear Motion Carriage Driven and Guided by Elastically Supported and Preloaded Lead Screw Nuts", presented at the *17th Annual Meeting of the American Society of Precision Engineering*, St. Louis, Missouri, October 20-25, 2002.
- 47) Slocum, A., Awtar, S., Elmouelhi, A, Graham, G. and Willoughby, P., "Paths-to-Peace: A New Method for Teaching Design and Manufacturing", DYD02: The 2nd International Conference on Open Collaborative Design for Sustainable Innovation (<http://www.thinkcycle.org/dyd02/> ), Bangalore India, December 1-2, 2002.
- 48) Optimal Design of a MEMS Relay Switch, M. P. Brenner, J. Li, J. Lang, J. Qiu and A. Slocum, *Model. Simulation of Microsystems*, pgs 214-217,(2002).
- 49) \*Qiu, J., Lang, J., Slocum, A.H., Strumpler, R., "A High-Current Electrothermal Bistable MEMS Relay", *Proceedings IEEE The Sixteenth Annual International Conference on Micro Electro Mechanical Systems 2003*, Kyoto Japan, January 19-23, 2003, Page 64-67
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- 51) \*Slocum A., Graham M., Abu-Ibrahim F., "Teaching Design with a Peer-Review Process", *Hawaii International Conference on Social Sciences*, June 12-15, 2003, Honolulu Hawaii, USA
- 52) Slocum A., Basaran M., Implementation of PC-Based Control On A Modular OD/ID Grinding Machine with Bearings Preloaded by Inclined Iron Core Linear Electric Motor, *Mechatronics, Automation And Control Symposium Of The Cobem 2003 Sao Paulo Brazil*
- 53) \*Werkmeister, J. Slocum, A., "Design and Fabrication of the MesoMill: A Five-Axis Milling Machine for Meso-Scaled parts" *Proc. of ASPE Winter Topical Meeting on Machines and Processes for Micro-scale and Meso-scale Fabrication, Metrology*, January 22-23, 2003
- 54) Ma, H., White, J., Paradiso, J., Slocum, A., "Sub-nanometer Displacement Sensing for the Nanogate – A Tunable Nanometer Gap", *IEEE Sensors Conference 2003*, Toronto, Canada.
- 55) Damazo, B., Donmez, A., McGlaufflin, M., Soons, J., Werkmeister, J., Slocum, A.,, "Performance Evaluation of a Prototype Machine Tool for Machining Meso-scaled Parts", *Proc. of ASPE Annual conf.*, Oct 28-30, Portland, OR, 2003
- 56) Forest, C.R., Akilian, M., Vincent, G., Lamure, A., Lapsa, A., Slocum, A.H., Schattenburg, M.L., "Thin glass optic and silicon wafer deformation and kinematic constraint", *Proc. of ASPE Annual conf.*, Oct 28-30, Portland, OR, 2003
- 57) \*Robertson , A.P., Slocum, A.H., "Design and Characterization of an Aerostatic Spherical Bearing", *Proc. of ASPE Annual conf.*, Oct 28-30, Portland, OR, 2003
- 58) Culpepper, M.L., A.H. Slocum and Bailey, P., Design of Low-cost Kinematic Couplings Using Formed Balls and Grooves in Sheet Metal Parts", *Proc. of ASPE Annual conf.*, Oct 28-30, Portland, OR, 2003
- 59) Culpepper, M.L., A.H. Slocum and DiBiasio, C.M., Design of Detachable Precision Fixtures which Utilize Hard and Lubricant Coatings to Mitigate Wear and Reduce Friction Hysteresis, *Proc. of ASPE Annual conf.*, Oct 28-30, Portland, OR, 2003

- 60) Willoughby, P.J., Hart, A.J., Slocum, A.H., "Experimental Determination of Kinematic Coupling Repeatability in Industrial and Laboratory Conditions", Proc. of ASPE Annual conf., Oct 28-30, Portland, OR, 2003
- 61) \*Werkmeister, J.B., Slocum, A.H., "Theoretical and Experimental Determination of the Stiffness Properties of a Capstan Drive", Proc. of ASPE Annual conf., Oct 28-30, Portland, OR, 2003
- 62) Ma, H., White, J., Paradiso, J., and Slocum, A. "Sub-nanometer Displacement Sensing for the Nanogate", Proceedings of the 2003 IEEE International Conf. on Sensors, Oct. 21-24.
- 63) Brenner, M., Lang, J., Li, J., Slocum, A., "Optimum Design of an Electrostatic Zipper Actuator", Nanotech 2004, Boston, MA
- 64) Chen, S., Golda, D., Hermann, A., Slocum, A., "Design of an ultra precision diaphragm flexure stage for out-of-plane motion guidance", ASME DETC, 2004.
- 65) \*Thompson, M. K, Thompson, J. M., Slocum, A. H., "The Effect of Surface Roughness on the Pressure Required for Coupler Sealing", 2004 International ANSYS Conference, Pittsburgh, PA, May 24-26th 2004. Received Best Paper Award.
- 66) Slocum, A, et al., "Magnetically Preloaded Wheels", Proc. of 4th European Union Society for Precision Engineering and Nanotechnology International Conference, Glasgow, Scotland (UK), pp368-369, May31-June 3, 2004.
- 67) Hou S.M., Lang J.H., Slocum A.H., Weber A.C., White J.H., "A High-Q Widely-Tunable Gigahertz Electromagnetic Cavity Resonator" Solid-State Sensor, Actuator and Microsystems Workshop, June 6 – 10, 2004, Crowne Plaza Resort, Hilton Head Island, South Carolina
- 68) Brenner, M.P., Lang, J.H., Li, J., Slocum, A.H, "Optimal Design of an Electrostatic Zipper Actuator", Proc. 2004 NSTI Nanotechnology Conference and Trade Show, Volume 2, pp 371-374
- 69) Akilian, M., Forest, C.R., Slocum A.H., Trumper, D.L., Schattenberg, M.L., "Thin Optic Constraint", Proc. of ASPE Annual conf., Oct 4-7, Orlando, FL, 2004
- 70) Sprunt, A.D., Slocum A.H., "Implementation of Kinematic Web Handling", Proc. of ASPE Annual conf., Oct 4-7, Orlando, FL, 2004
- 71) Werkmeister, J.B., Slocum, A.H., "Investigating Different Methods of Bonding Glass Substrates", Proc. of ASPE Annual conf., Oct 4-7, Orlando, FL, 2004
- 72) Slocum, A.H., Basaran, M., "Linear Motor Preloaded and Driven Precision machines", 4<sup>th</sup>. Intl. Conf. Advanced Engineering Design, Glasgow, Scotland, Sept. 5-8, 2004.
- 73) Crane N. B., Gray J. M., Mendelowitz S.E., Wheeler J.W., Slocum A.H., "Design and Feasibility Testing of a Novel Device for Automatic Distraction Osteogenesis of the Mandible", DETC 2004-57232, Proc. of ASME DETC'04, September 28-October 2, 2004, Salt Lake City, Utah USA
- 74) Ning, H., Williams, J.R., Slocum, A.H., Sanchez, A, "InkBoard Tablet PC Enabled Design-oriented Learning", CATE-2004 conf. Kauai, Hawaii, USA.
- 75) Sutin J., Awtar, S, Hart A.J., Slocum A.H., Gratton, E, 'Improving the performance of the optical microscope via modern opto and optomechanical design", Focus On Microscopy, Jena, Germany, March 2005.
- 76) Awtar, S., Slocum, A.H., "A Large Range XY Flexure Stage for Nanopositioning", euspen annual conference, Montpellier, France, 2005.
- 77) Awtar, S., Slocum, A.H., "Closed-form Nonlinear Analysis of Beam-based Flexure Modules", Proceedings of IDETC/CIE 2005
- 78) Slocum, A.H., Willoughby, P., Werkmeister, J., "Silicon Insert Molded Plastic (SIMP)", ASPE Spring Topical Mtg, Dayton OH April 2005.
- 79) Freeman, D., Slocum, A., "Precision Testing Of A Low-Cost, High-Precision Automotive Valve", Proc. of 5th European Union Society for Precision Engineering and Nanotechnology International Conference, Montpellier, France, May 2005



- 80) Hart, A.J., Slocum, A.H., "Design and Fabrication of Microchannel Arrays for Combinatorial Studies of Nanomaterials Growth", Proc. of 5th European Union Society for Precision Engineering and Nanotechnology International Conference, Montpellier, France, May 2005
- 81) Awtar, S., Slocum, A.H., ASME 2005 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, September 24-28, 2005, Long Beach, California, USA

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\*Outgrowth of supervised student research.

#### 4. Other Major Publications:

- 1) Slocum, A. H., (Executive Producer) for inner-city kids' rap group Mental Block, their first CD entitled "IF".
- 2) Slocum, A. H., (Executive Editor) for Marc Graham's book of poems and images entitled "JoTLS" (Journey of The Lost Souls) [www.jotls.com](http://www.jotls.com).

#### 5. Internal Memoranda and Progress Reports:

None

#### 6. Invited Lectures:

1. April 1986, "Flexible Automated Fixturing Systems," SME Conf. on Jigs and Fixtures, Cincinnati, OH.
2. Dec. 1986, "A Five Axis Robotic Micromanipulator," ASME Winter Annual Meeting, Anaheim, California.
3. Dec. 1986 "A Servo-Controlled Pneumatic Double Gripper with Changeable Fingers," ASME Winter Annual Meeting, Anaheim, CA.
4. Sept. 1989, *Precision Machine Design*, Short course for the American Society for Precision Engineering Annual Meeting in Monterey, CA.
5. Sept. 1990, *Precision Machine Design*, Short course for the American Society for Precision Engineering Annual Meeting in Rochester, NY.
6. Oct. 1991, *Precision Linear Motion Bearing Design*, Short course for the American Society for Precision Engineering Meeting in Santa Fe, NM.
7. Oct. 1991, *Error Budgeting and Machine Modeling*, Short course for the American Society for Precision Engineering Meeting in Santa Fe, NM.
8. Oct. 1992, *Actuators for Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Orlando, FL.
9. Oct. 1992, *Applications of Ceramic Materials in Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Orlando, FL.
10. Nov. 1993, *Actuators for Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Seattle, WA.
11. Nov. 1993, *Applications of Ceramic Materials in Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Seattle, WA.
12. Nov. 1993, *Design of Damping Systems for High Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Seattle, WA.

13. Nov. 1994, *Actuators for Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Cincinnati, OH.
14. Nov. 1995, *Actuators for Precision Machines*, Short course for the American Society for Precision Engineering Meeting in Phoenix, AZ.
15. Oct. 2000, *Getting Students Psyched about Engineering and Science*, Robofesta Conf., Osaka, Japan
16. Nov. 2000, *Advances in Machine Tool Design*, ASME Winter Annual Meeting, Orlando, FL
17. July 2001, *Advances in Machine Elements*, keynote address, 10 International Conference on Precision Engineering, Yokohama, Japan.
18. Nov. 2002, *Mechanics of Designing Precision Machines*, Harvard University, Division of Engineering and Applied Science Dept. seminar
19. April. 2003, *The Nanogate*, Harvard University, Division of Engineering and Applied Science Dept. seminar
20. June 2003, *Characterization and Fabrication of the NanoGate for Nanoscale Fluidics, Wireless Communications, and ?*, NSF Workshop on Nanoscale Mechanical Engineering, Arlington, VA Nov. 2002
21. Nov. 2003, *Advances in Precision Machine Design*, keynote speaker, Mechatronics, Automation and Control Symposium of the COBEM 2003 Sao Paulo Brazil
22. Nov. 20, 2003, "Fundamentals of MEMS machines", Invited lecture, University of Florida
23. March 22, 2004, "Fundamentals of Precision Machine Design", invited lecture, Brigham Young University
24. March 22, 2004, "Applying Macro Machine Design Experience to Dinky Designs", invited lecture, Brigham Young University
25. May 17, 2004, "Fundamentals of Precision Machine Design", invited lecture, Ohio State University
26. June 2, 2004, "Magnetically Preloaded Friction Drive System", Invited keynote speaker, European Union Society for Precision Engineering & Nanotechnology annual meeting.
27. Sept. 6, 2004, "A design Environment to Teach Students about Optimal Transmission Ratios", 4<sup>th</sup>. Intl. Conf. Advanced Engineering Design, Glasgow, Scotland, Sept. 5-8, 2004.

#### Theses Supervised by Alexander H. Slocum

	<u>Total</u>	<u>Completed</u>	<u>In Progress</u>
S.B.	37	29	8
S.M.	40	39	1
Engineers	1	0	1
Doctoral Supervisor:	34	26	8
Doctoral Reader (committee member):	25	24	1

#### S.B. Theses:

- 1) Robinson, Darryl K., "Design of a Prototype Fastening System for the Trackbot Automated Construction Robot," May 1986.
- 2) Kang, Jiin, "Design of a Track Positioning Mechanism for an Interior Wall Construction Robot," June 1986.
- 3) Paulson, Bruce A., "Design of a Materials Handling System to Automate Interior Wall Construction," June 1986.
- 4) Thackston, III, George W., "Design of an Automatically Guided Vehicle for Use in Automated Drywall Construction," June 1986.
- 5) Gladwin, S. C., "Design and Assembly of a Construction Robot Subsystem to Fasten Drywall to Studs," June 1986.

- 6) Shiller, Andrew., "Kinematic Analysis of A Precision Slide," June 1987.
- 7) Gregory, Arthur, "Vacuum Gripper Design for Automated Assembly," , June 1987.
- 8) Wurman, Peter, "Anechoic Chamber Design and Acoustical Analysis of Room 1-051," June 1987.
- 9) Heatzig, Eric, "Scaffbot-A Servo Controlled Scaffolding Device," June 1987.
- 10) Huang, Stanley, "Design and Implementation of a Software Controller for a Wall Building Robot," June 1987, (Electrical Engineering and Computer Science).
- 11) Barrientos, Miguel, June 1993, "Tools for Developing Countries".
- 12) Mateo, Evan, "Semiconductor Wafer Gripper", June 1994.
- 13) Phillips, Alton, "Electrostatic Air Cleaner", June 1994.
- 14) Hicks, Robert, "A Handbook for 2.007", Jan. 1997.
- 15) Youngbear, Kathy, "Optimal Truss Design", June 1997.
- 16) Richkus, Rebecca, "A New Pump Dispenser", June 1997.
- 17) Lang, Mike Schmidt, "A New Wind Tunnel Support Mechanism", June 1997.
- 18) Sha, Raj, "A Web-Based System for Teaching 2.007", June 1997.
- 19) Allen, Holly, "Multimedia as a Teaching Tool in 2.007", June 1998.
- 20) Miller, John, "Design of an Anti-Backlash Transmission for Position Control Applications", June 1998.
- 21) Butville, Michael, "Driveshaft Design for a Dynamometer Utilizing Rotary Motion Flexural Bearings", June, 1998.
- 22) Kisai , Darul "Mechanical Design of Chassis and Drivetrain for an Autonomous Mobile Robot", June 2001
- 23) Harper, Kelly, "Redesign of Industrial Pin Joint Test Apparatus", June 2001
- 24) Browne, Courtney, "Design of a 2.007 machine with All-Terrain Suspension", June 2004.
- 25) Read, Melissa, "Designing a Better Hair Straightener, June 2004
- 26) Kahn, Christopher, "Solution for Modular Die-Level Anodic Bonder", June 2004.
- 27) James, Richard, "Design of an Aluminium Differential Housing and Driveline Component for High Performance Application Abstract", June 2004.
- 28) Makadam, Kabir, "Design of a Silicon Wafer Fracturing Instrument", January 2005.
- 29) Gomez III, Nicasio, "PCV Valve Flutter: Vibration Characterization through Pressure and Flow", June 2005

S.M. Theses:

- 1) Hou, William M., "Conceptual Design of an Automated System for Emplacement and Retrieval of Nuclear Waste," January 1987.
- 2) Schena, Bruce, "Design Methodology for Large Work Volume Robotic Manipulators: Theory and Application," Sept. 1987.
- 3) Gedney, Richard, "Sensor and Control System Design for Automated Testing of Structural Materials," January 1988.
- 4) Damazo, Bradford, "Mechanical, Sensor, and Control System Design of an Accelerometer Calibrator with One Part Per Million Accuracy," January 1988.
- 5) Ousterhout, Karl, "Design of a Force and Position Servo Controlled Robotic Gripper with a 50:1 Grip Force to Weight Ratio," January 1988.
- 6) Levy, David, "Studbot: A Construction Robot for the Automated Assembly of Steel-Stud Partition Walls," Sept. 1987.
- 7) Ziegler, Andrew, "Studwelder: A Construction Robot for In-Situ Automated Welding of Shear Studs," June 1988.
- 8) Heatzig, Eric, "Modular digital servo controller," June 1989 (Civil Engineering).
- 9) Carey, John, "Methodologies of Controller Design for Precision Linear Motion Systems," June 1992.
- 10) Gaub, Heinz, "Hydrostatic Linear Motion Bearings for Precision Machine Tools," June 1992.
- 11) Schmeichen, Philip, "Design of Precision Kinematic Systems", Jan. 1993.

- 12) Bhathena, Firdaus, "Mapped Control Systems for Precision Machines" (Co-supervisor with Prof. Lang), June 1993.
- 13) Mintz, David, "Precision Measuring Systems", June 1993.
- 14) Smith, Michael, "Adaptive Control Systems for Precision Machines" (Co-supervisor with Prof. Annaswamy), June 1993.
- 15) Br  nner, Christoph, "Self Compensating Hydrostatic Bearings for Grinding Machine Tables", January 1994.
- 16) Chiu, Michael, "Design of a Precision High Speed Tool Servo", January 1994.
- 17) Wasson, Kevin, "High Speed Hydrostatic Spindle Design" 1994.
- 18) Culpepper, Martin, "Design of Debris Cleaner Using a Compound Auger and Vacuum Pick Up", January 1997.
- 19) Scrivens, Jevin, "A Wireless Robot for Semiconductor Manufacturing Equipment", June, 1997.
- 20) Houdek, Phillip, "Design and Implementation Issues for Stewart Platform Configuration Machine Tools", June 1997.
- 30) Alden, John, "Active Kinematic Coupling", June 1997.
- 31) Ellahi, Farooq, "An Integrated Decanter Centrifuge-Pitot Pump", June 1997
- 32) Brienlinger, Keith, "Hexapod Home Flight Simulator", August 1998.
- 23) Balakrishnan, Asha, "Planarized Ball Grid Arrays", June 1999.
- 24) Lang, Michael Schmidt, "Wireless Robot and Effector", June 1999.
- 33) Rohatgi, Gaurav, "Damped Tool Holder", Approaches for Chatter Reduction in Deep Cavity and Intricate Surface Milling, June 1998.
- 34) Cortesi, Roger, "An Easy to Manufacture Non-Contact Precision Linear Motion System and Its Applications", August 2000
- 35) Sprunt, Alex, "Electrical Contact tester", June 2002
- 36) Robertson, Alec, "Precision Aerostatic Spherical Joint", June 2003
- 37) Montgomery, Sean, "Electronics Curriculum for 2.007", June 2003
- 38) Werkmeister, Jaime, "Mesomill", June 2004
- 39) Thompson, Kate, "MEMS Fluid Coupling", June 2004
- 40) Abu-Ibrahim, Fadi, "Low-cost precision waterjet", June 2004
- 41) Vanderpoel, Timothy, "Design of a Snowboard Simulating Exercise Device", June 2005

#### Engineer Degree

- 1) Werkmeister, Jaime, "Development of Silicon Insert Molded Plastic (SIMP)", June 2005

#### Doctoral Theses, Supervisor:

- 1) Demsetz, Laura, "Methodology for Formulating Designs of Task Specific Automated Construction Machinery", Jan. 1989. (Civil Engineering).
- 2) Everett, John, "Construction Automation: Basic Task Selection and Development of the Cranium", June 1991. (Civil Engineering).
- 3) Marsh, Eric, "Design of Precision Coordinate Measuring Machines", June 1994.
- 4) Van Doren, Matthew, "Precision Machine Design Methodology for Design of Semiconductor Processing Equipment", June 1995.
- 5) Scagnetti, Paul, "Design of Precision Grinding Machines for Ceramics", January 1996.
- 6) Ho, Chris, "Concurrent Development of a Rotationally-Symmetric Barb Joint for Modular Storage Systems through Product Innovation Research", June 1997.
- 7) Levy, David, "Portable Product Miniaturization and the Ergonomic Threshold", August 1997.
- 8) Braunstein, Daniel, "Precision Printed Circuit Board Manufacturing", August 1997.
- 9) Chiu, Michael, "High Precision Semiconductor Equipment Test Design", January 1998.
- 10) Nayfeh, Samir, "Design and Application of Damped Machine Elements", June, 1998.
- 11) Pfahnl, Andreas, "Design of Precision Temperature Controlled Precision Machine Tools", June 1998.

- 12) Hale, Layton, "Error Budgeting Tools for Precision Machine Design", January 1999
- 13) Hochmuth, Carsten, "Platform Concept for Precision Machining Centers", January 1999
- 14) Kiani, Saphir, "Multi-connection vias for printed circuit boards", January 1999.
- 15) Vallance, Ryan, "Precision Miniature Mechanism Manufacture", June 1999.
- 16) Muller, Luis, "Modular Semiconductor Test, Assembly & Packaging Manufacturing Equipment Design", June 1999.
- 17) Kane, Nathan, "Surface Self-Compensated Modular Linear Hydrostatic Bearings", June 1999.
- 18) Culpepper, Martin, "Design and Application of Compliant Quasi-Kinematic Couplings", January 2000.
- 19) Bamburg, Eberhard, "Principles of Rapid Machine Design", June, 2001.
- 20) O'Sullivan, Donald, "Structural Elements with Mathematically Defined Surfaces for Enhanced Structural and Acoustic Performance", August 2001.
- 21) White, James, "The Nanogate: Nanoscale Flow Control", June 2003.
- 22) Qiu, Jin, "An Electrothermally-Actuated Bistable MEMS Relay for Power Applications", June., 2003.
- 23) Brienlinger, Keith, "Three Dimensional Routed Manifolds with Externally Inserted Cables", June , 2003.
- 24) Sihler, Joachim, "A Low Leakage 3-Way Silicon Microvalve", January 2004
- 25) Awtar, Shorya, "Synthesis and Analysis of Parallel Kinematic XY Flexure Mechanisms", January 2004
- 26) Li, Jian, "Electrostatic Zipping Actuators and Their Application to MEMS", January 2004
- 27) Graham, Marc, "Product Development by Deterministic Design", work initiated Sept., 1999
- 28) Freeman, David, "Resonator PCV Valve", work initiated Sept., 2000
- 29) Sprunt, Alex, "Fracturgate", work initiated Sept., 2002
- 30) Yang, Xueen, "MEMS LC Tunable Filter", work initiated Sept., 2002
- 31) Pat Willoughby, "Elastically Averaged Precision Alignment", June 2005
- 32) Hart, John, "Continuous Growth Nanotubes", work initiated Sept., 2002
- 33) Ma, Hong, "Nanogate Capacitor", work initiated Sept., 2003
- 34) Balakrishnan, Asha, "Soft Tissue measurement", work initiated Sept., 2002

Doctoral Theses, Reader:

- 1) Bausch, John J. III, "Kinematic Methods for Automated Fixture Design", Jan. 1990.
- 2) Trumper, Dave, "Magnetic Suspension Techniques for Precision Motion Control", Sept. 1990 (Electrical Engineering and Computer Science).
- 3) Chai, Jangbom, "Non-Invasive Diagnostics of Motor-Operated Valves", June 1993.
- 4) Mosleh, Mohsen, "The Role of Wear Particles in Geometrically Constrained Frictional Systems in Dry Sliding", June 1994.
- 6) Walczyk, Daniel, "A Complete Sheet Metal Forming System Incorporating a New Quick Prototyping Method for Dies", January 1996.
- 7) Frey, Daniel, "Using Product Tolerances to Drive Manufacturing System Design", June 1997.
- 8) Williams, Mark, "Precision Six Degree of Freedom Magnetically-Levitated Photolithography Stage", October 1997.
- 9) Pfahnl, Andy, "Design of a Thermal Control System for an IC Test-In-Tray Handler", June 1998.
- 10) Ludwick, Stephen, "High-Speed Lens Cutting Machine", MIT, Mechanical Engineering, June, 1999.
- 11) Liebman, Michael, "Five-Axis Grinding Machine for Centimeter-scale Parts", MIT, Mechanical Engineering, June 2002.
- 12) Sweetland, Mathew, "Precision Thermal Control System for Semiconductor Devices Under test", MIT, Mechanical Engineering, June 2002.
- 13) Meggiolaro, Marco, "Achieving Fine Absolute Positioning Accuracy in Large Powerful Manipulators", Mechanical Engineering, June 2002.

- 14) Hidrovo, Carlos, "Development of a Fluorescence Based Optical Diagnostics Technique and Investigation of Particle Ingestion and Accumulation in the Contact Region of Rotating Shaft Seals", Mechanical Engineering, June 2001.
- 15) Sujan, Vivek, "Compensating for Model Uncertainty in the Control of Cooperative Field Robots", June, Mechanical Engineering, 2002.
- 16) Konkola, Paul, "Phase Interference Gratings", Mechanical Engineering, June, 2003
- 17) Savran, Cagri, "A Robust Micromechanical Sensor for Label-free Biomolecular Detection in Real-time", Mechanical Engineering, Jan. 2004
- 18) Griffith, Saul, "Self Assembling 3D structures", Mechanical Engineering, June 2004
- 19) Kevin Turner, "Wafer Bonding: Mechanics-Based Models and Experiments", Mechanical Engineering, June 2004
- 20) Eric Wilhelm, "Printed Electronics and Micro-Electromechanical Systems", Mechanical Engineering, June 2004
- 21) Hai Ning, "Building E-Education Platforms For Design-Oriented Learning:", Civil Engineering, June 2004.
- 22) Sparks, Andrew, "Scanning Probe Microscopy With Inherent Disturbance Suppression Using Micromechanical Devices", Mechanical Engineering, Sept. 2004
- 23) Andrew Wilson, "Wafer Bonding", June 2004
- 24) Kripa Varanasi "Damping mechanisms", June 2004
- 25) Rick Montesanti, "High speed tool servo"